BRAINWARE UNIVERSITY
Term End Examination 2020 - 21
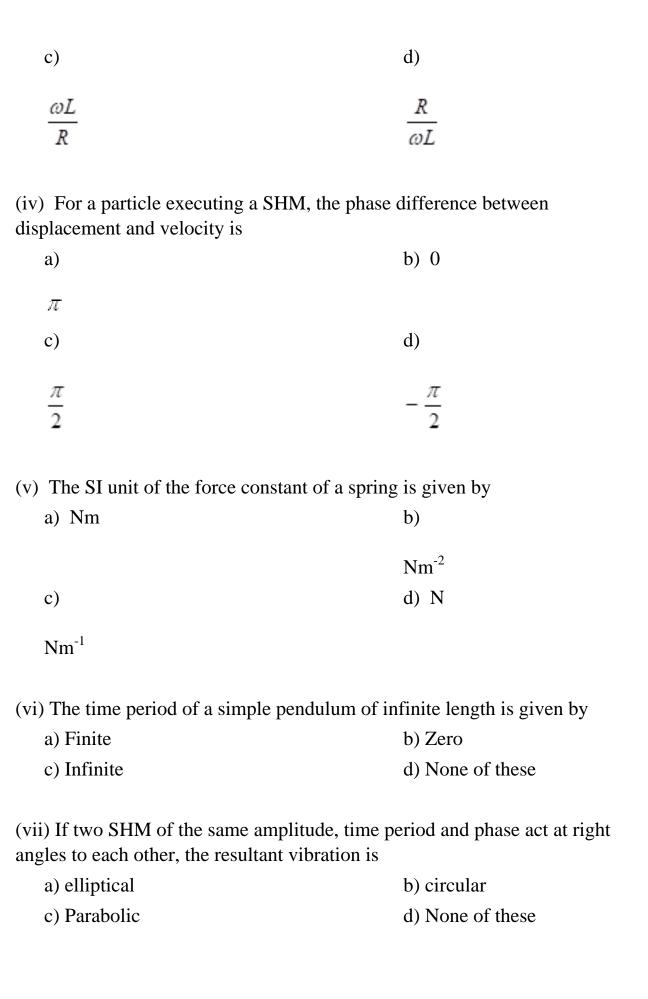**Programme – Bachelor of Technology in Electronics & Communication Engineering**
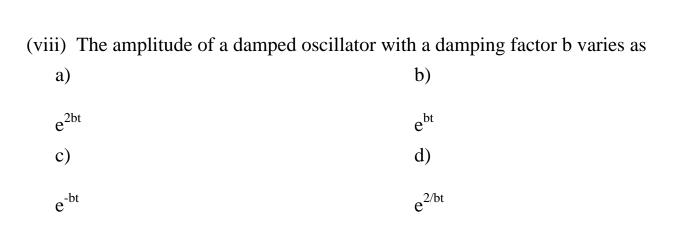**Course Name – Physics**
Course Code - BPHY010101
Semester / Year - Semester I

Time allotted : 85 Minutes   Full Marks : 70

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question)   1 x 70=70

1.   *(Answer any Seventy)*

(i) For small value of damping constant, the quality factor

   a) Decreases   b) Increases

   c) Remain constant   d) None of these

(ii)

A particle of mass 10 gm lies in a potential field $v = 50 x^2 + 100$. The value of frequency of oscillations in Hz is

   a) 5 Hz   b)

$$\frac{5}{\pi}$$

   c)   d) none of these.

$$\frac{10\,\pi}{3}$$

(iii) The quality factor Q for an L-C-R circuit is

   a)   b)

$$\frac{\omega R}{L} \qquad\qquad\qquad \frac{\omega}{LR}$$

c)

$$\dfrac{\omega L}{R}$$

d)

$$\dfrac{R}{\omega L}$$

(iv) For a particle executing a SHM, the phase difference between displacement and velocity is

a)

$$\pi$$

b) 0

c)

$$\dfrac{\pi}{2}$$

d)

$$-\dfrac{\pi}{2}$$

(v) The SI unit of the force constant of a spring is given by

a) Nm

b)

$$Nm^{-2}$$

c)

$$Nm^{-1}$$

d) N

(vi) The time period of a simple pendulum of infinite length is given by

a) Finite
b) Zero
c) Infinite
d) None of these

(vii) If two SHM of the same amplitude, time period and phase act at right angles to each other, the resultant vibration is

a) elliptical
b) circular
c) Parabolic
d) None of these

(viii) The amplitude of a damped oscillator with a damping factor b varies as

a)

e^{2bt}

b)

e^{bt}

c)

e^{-bt}

d)

$e^{2/bt}$

(ix) For small value of damping constant, the resonance

a) Is flat

b) Is sharp

c) Remains same

d) None of these

(x) The phase difference between the driving force and the velocity of the forced oscillator is

a)

φ

b)

$\dfrac{\pi}{2}+\varphi$

c)

$-\varphi+\dfrac{\pi}{2}$

d)

$\varphi+\pi$

(xi) When a spring with spring constant k is cut into three equal parts, the force constant of each of the part would be

a) k/3

b) 3k

c) k

d) None of these

(xii)

A string is 80.0 cm long and has a mass per unit length of 5.51×10^{-4} kg/m. The tension in the string is 200 N. In the fundamental mode, the string vibrate with a frequency

a) 376 Hz   b) 390 Hz

c) 400 Hz   d) 512 Hz

(xiii) Given a string of length 2 m with two fixed ends, the possible longest wavelength of the standing wave is

a) 1 m   b) 2m

c) 4 m   d) 8 m

(xiv) The fundamental frequency of a standing wave traveling at a speed of 20 m/s through a string of length 4 m is

a) 2 Hz   b) 2.5 Hz

c) 4 Hz   d) 5 Hz

(xv) The ratio of velocity of sound in hydrogen and oxygen at STP is

a) 4:1   b) 16:1

c) 2:1   d) 4:3

(xvi) The quantity which does not change, when sound enters from one medium to another

a) Speed   b) Frequency

c) Wavelength   d) Velocity

(xvii) Sound propagates maximum in

a) Gas   b) Liquid

c) Solid   d) All

(xviii) Lights can travel in a vacuum but not sound, because

a) Speed of sound is very slow than light   b) Light waves are electromagnetic in nature

c) Sound waves are electromagnetic in nature   d) Light waves are not electromagnetic in nature

(xix)

The phase velocity of a wave having a group velocity of 6 x 10^6 is (in order of 10^8 m/s)

   a) 2.5   b) 3

   c) 100   d) 150

(xx) The phase and group velocities do not depend on which of the following?

   a) Frequency   b) Wavelength

   c) Phase constant   d) Attenuation constant

(xxi) Which of the following phenomena causes polarization of light?

   a) Reflection   b) Refraction

   c) Double Refraction   d) all of these

(xxii) Which of the following phenomena proves that light is a transverse wave?

   a) Interference   b) Dispersion

   c) Diffraction   d) Polarization

(xxiii) Plane polarized light can be produced by

   a) Reflection at polarizing angle   b) Nicol prism

   c) Piles of plates   d) All of these

(xxiv) The number of optic axes in a uniaxial crystal is

   a) 1   b) 2

   c) 5   d) 10

(xxv) The nature of the wave front due to a point source of light is

   a) Spherical   b) Plane

   c) Cylindrical   d) None of these

(xxvi) For constructive interference, the phase difference is an even multiple of

a)

$\dfrac{\pi}{2}$

b)

2π

c)

π

d) None of these

(xxvii) The Newton's rings for the transmitted system of a monochromatic source of light is

a) Dark

b) Partially dark

c) Bright

d) None of these

(xxviii) Radii of Newton's rings are proportional to

a) Square root of natural number

b) Square of natural number

c) Natural number

d) None of thesex

(xxix) Two sources will be coherent if they have

a) Constant wavelength

b) Constant phase difference

c) Constant amplitude

d) None of these

(xxx) In Fresnel diffraction the source of light is effectively at

a) Finite distance

b) Infinite distance

c) Both finite and infinite

d) None of these

(xxxi) In Fraunhofer diffraction minima are

a) All perfectly dark

b) Never perfectly dark

c) Perfectly bright

d) None of these

(xxxii) The intensity of central maximum due to double slit diffraction pattern is ----------times greater than that of single slit pattern.

a) 8

b) 3

c) 4

d) 2

(xxxiii) The resolving power of a grating, having N number of total rulings, in nth order is

a) n/N

b) nN

c) N/n

d) none of these

(xxxiv) If white light is used in Newton's rings experiment, then

a) A number of coloured rings will be observed

b) No rings will be observed

c) Black and white rings will be observed

d) None of these

(xxxv) If Young's double slit experiment with one source of light and two slits be performed in water instead of air

a) The fringes will be smaller in number

b) The fringes will be narrower

c) The fringes will be broader

d) No fringes will be ontained

(xxxvi) If the wavelength of the light used in single slit diffraction is increased then the width of the central maxima

a) Decreases

b) Increases

c) Remains same

d) None of these

(xxxvii) A diffraction pattern is obtained using a beam of red light. What happen if the red light is replaced by blue light

a) Bands disappear

b) Bands become broader and farther apart

c) No change

d) Diffraction bands became narrower and crowded

(xxxviii) An elliptically polarized light is a general case of

a) Only the linearly polarized light

b) Only the circularly polarized light

c) Both of linearly and circularly polarized light

d) None of these

(xxxix) An unpolarised light consists of

a) Infinite number of plane polarized light

b) Finite number of plane polarized light

c) Only two plane polarized light

d) None of these

(xl) The optic axis is a direction along which

a) The O-ray travels faster than the E-ray

b) The E-ray travels faster than the O-ray

c) Both O-ray and E-ray travel with the same velocity

d) None of these

(xli) In a half-wave plate, the phase difference between the O-ray and E-ray is

a)

$$\frac{\pi}{2}$$

b)

$$\pi$$

c) 0

d) None of these

(xlii)

If θ_p be the angle of polarization, then the refractive index μ of the material is given by

a)

$\sin \theta_p$

b)

$\cos \theta_p$

c)

$\tan \theta_p$

d)

$\sec \theta_p$

(xliii) A Nicol prism can act as a

a) Polarizer   b) Analyzer

c) Both polarizer and analyzer   d) None of these

(xliv) If light is incident at the angle of polarization then the angle between the reflected ray and refracted ray is

a)   b)

$$\frac{\pi}{2}$$ $$\frac{\pi}{4}$$

c)   d)

$$\pi$$ $$\frac{3\pi}{2}$$

(xlv) Two waves having intensities in the ratio of 9:1 produce interference. The ratio of maximum to minimum intensity is equal to

a) 10 : 8   b) 9 : 1

c) 4 : 1   d) 2 : 1

(xlvi) Intensity of light depends upon

a) Velocity   b) Wavelength

c) Amplitude   d) Frequency

(xlvii) Soap bubble appears coloured due to the phenomenon of

a) Interference   b) Diffraction

c) Dispersion   d) Reflection

(xlviii) The size of the diffraction object should be

a) Greater than the wavelength of light used   b) Comparable to the order of the wavelength of light

c) Less than the wavelength of light used   d) None of these

(xlix) In Michelson's interferometer 100 fringes across the field of view when the movable mirror is displaced through 0.0248 mm, the wavelength of monochromatic light used is

a) 585.6 nm   b) 589 nm

c) 556 nm   d) 555.5 nm

(l) Second glass plate in Michelson 's Interferometer is known as

a) Extra glass plate   b) Simple Glass Plate

c) Compensating glass plate   d) None of these

(li) Which of the following material may he used for manufacturing Polaroid?

a) Calcite   b) Tourmaline

c) Quartz   d) Quinine iodosulphate

(lii) Which of the following phenomena can explain quantum nature of light

a) Interference   b) Diffraction

c) Polarization   d) Photoelectric effect

(liii) When the compact disk is illuminated by a source of white light, coloured lines are observed, the phenomenon is due to

a) Dispersion   b) Diffraction

c) Interference   d) Refraction

(liv) The angular resolution of a 10 cm diameter telescope at a wavelength of 500 nm is of the order of

a)   b)

10^6 rad 10^2 rad

c)   d)

10^{-2} rad 10^{-6} rad

(lv) An optically active compound

a) Rotates the plane of polarized light   b) Changes the direction of polarized light

c) Does not allow plane polarized light to pass through   d) None of these

(lvi) Which of the following is essential for observing diffraction?

a) A narrow slit   b) White light

c) Screen   d) Two coherent sources

(lvii) The astronomical telescope consists of objective and eyepiece. The focal length of the objective is

a) Equal to that of the eyepiece.   b) Shorter than that of eyepiece

c) Greater than that of eyepiece   d) Five times shorter than that of eyepiece

(lviii) Light appears to travel in straight lines since

a) It is not absorbed by the atmosphere   b) It is reflected by the atmosphere

c) Its wavelength is very small   d) Its velocity is very large

(lix) In He-Ne laser neon atoms get energy

a) On collision with He atoms   b) From chemical reactions

c) From electrical pumping   d) From optical pumping

(lx) In lasing action, the spontaneous emission does not depend on

a) The number of atoms present in the excited state   b) The intensity of the incident light

c) Both intensity and number of atoms   d) None of these

(lxi) In a ruby laser, population inversion is achieved by

a) Optical pumping   b) Inelastic atom-atom collision

c) Chemical reaction   d) Applying strong electric field

(lxii) The wavelength of of He-Ne laser is

a) 632.8 nm

b) 600 nm

c) 532.8 nm

d) 500 nm

(lxiii) In a He-Ne laser, the laser transition takes place in

a) He only

b) Ne only

c) Ne first, then in He

d) He first, then in Ne

(lxiv) The ratio of Einstein's A and B coefficient is proportional to

a)

ν

b)

ν^2

c)

ν^3

d)

$\dfrac{1}{\nu}$

(lxv) The metastable state has a mean life-time of more than

a)

10^{-3} s

b)

10^{-5} s

c)

10^{-4} s

d)

10^{-2} s

(lxvi) The population of electron in different energy states of a system in the thermal equilibrium is governed by

a) Bragg's law

b) Einstein relations

c) Boltzmann distribution law

d) Wien's displacement law

(lxvii) The Eximer laser produces light with what wavelength?

a) Visible

b) Ultraviolet

c) Infrared   d) None of these

(lxviii) In the structure of fiber optic cable refractive index of core is always
--------- the refractive index of cladding

    a) Less than   b) Equal to
    c) Greater than   d) None of these

(lxix) Total internal reflection of light will take place if a ray of light is incident
from

    a) Air to water   b) Air to glass
    c) Water to glass   d) Glass to water

(lxx) Optical fibre is related to

    a) Field of communication   b) Light
    c) Agriculture   d) None of these